Claims:

1. (Currently Amended) A system operable to substantially automatically perform an evaluation of a sample of a material according to an established standard, wherein the system comprises:

a microscope operable to magnify the sample;

a light source operable to illuminate the sample, wherein the illumination is provided at a grazing angle so as to enhance ~~surface~~ a contrast between surface features of the sample;

a stage associated with the microscope and operable to move and position the sample under the microscope for viewing;

an image capturing mechanism operable to capture an image of the sample through the microscope; and

a computing device operable to control magnification by the microscope, control illumination by the light source, receive images from the image capturing device, control movement of the stage, and store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom, and to generate a report setting forth a result of the analysis.

2. (Original) The system as set forth in claim 1, wherein the analysis includes identification and measurement of one or more components of the sample.

3. (Original) The system as set forth in claim 1, wherein the analysis includes identification and measurement of one or more physical features of the sample.

4. (Original) The system as set forth in claim 1, wherein the sample is prepared prior to being magnified by the microscope, wherein such preparation facilitates the analysis.

5. (Original) The system as set forth in claim 1, wherein the material is concrete and the sample is prepared in accordance with the established standard prior to being magnified by the microscope, wherein such preparation includes polishing a face of the sample, and the analysis includes identifying and measuring a number of voids in the sample.

6. (Original) The system as set forth in claim 1, wherein the image capturing mechanism is a CCD camera.

7. (Original) The system as set forth in claim 1, wherein the stage is a high-precision two-dimensional stage controlled by the computing device to avoid overlapping fields-of-view.

8. (Original) The system as set forth in claim 1, wherein the computer program provides a graphical user interface operable to facilitate a user setting up and initiating the analysis, and to facilitate the user causing the report to be generated.

9. (Original) The system as set forth in claim 1, wherein the computer program performs a number of different image analysis techniques on the image, including -

a color segmentation and recognition technique operable to facilitate identification and classification of an object in the image, and to differentiate the object from other objects in the image;

a shape feature segmentation and analysis technique operable to extract the object from the image and to characterize a shape of the object; and

a intensity profile segmentation and recognition technique operable to identify a unique characteristic of a profile of the object.

10. (Original) The system as set forth in claim 9, wherein the color segmentation and recognition technique is based on one or more color planes selected from the group consisting of: three color RGB, hue, and saturation.

11. (Original) The system as set forth in claim 9, wherein the color segmentation and recognition technique uses a nearest neighbor technique to identify and classify the object.

12. (Original) The system as set forth in claim 9, wherein the color segmentation and recognition technique uses a neural network and an associated rulebase to identify and classify the object.

13. (Original) The system as set forth in claim 9, wherein the object is a void and the shape feature segmentation and analysis technique is operable to extract the void from the image and to characterize the shape of the void by correlating a bright area of the void with a dark region of the void using a fuzzy logic correlator, wherein the bright area and the dark region are enhanced by the grazing angle of the illumination.

14. (Currently Amended) A system operable to substantially automatically perform an evaluation of a prepared sample of a material according to an established standard, wherein the system comprises:

a microscope operable to magnify the prepared sample;

a light source operable to illuminate the prepared sample, wherein the illumination is provided at a grazing angle so as to enhance ~~surface~~ a contrast between surface features of the sample;

a high-precision two-dimensional stage associated with the microscope and operable to move and position the prepared sample under the microscope for viewing;

a CCD camera operable to capture an image of the prepared sample through the microscope; and

a computing device operable to control magnification by the microscope, control illumination by the light source, receive images from the image capturing device, control movement of the high-precision of the two-dimensional stage so as to avoid overlapping fields-of-view, and store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom, wherein the analysis includes -

a color segmentation and recognition technique operable to facilitate identification and classification of an object in the image, and to differentiate the object from other objects in the image,

a shape feature segmentation and analysis technique operable to extract the object from the image and to characterize a shape of the object, and

a intensity profile segmentation and recognition technique operable to identify a unique characteristic of a profile of the object.

15. (Original) The system as set forth in claim 14, wherein the analysis includes identification and measurement of one or more components of the sample.

16. (Original) The system as set forth in claim 14, wherein the analysis includes identification and measurement of one or more physical features of the sample.

17. (Original) The system as set forth in claim 14, wherein the material is concrete and the sample is prepared in accordance with the established standard prior to being magnified by the microscope, wherein such preparation includes polishing a face of the sample, and the analysis includes identifying and measuring a number of voids in the sample.

18. (Original) The system as set forth in claim 14, wherein the computer program provides a graphical user interface operable to facilitate a user setting up and initiating the analysis, and to facilitate the user causing the report to be generated.

19. (Original) The system as set forth in claim 14, wherein the color segmentation and recognition technique is based on one or more color planes selected from the group consisting of: three color RGB, hue, and saturation.

20. (Original) The system as set forth in claim 14, wherein the color segmentation and recognition technique uses a nearest neighbor technique to identify and classify the object.

21. (Original) The system as set forth in claim 14, wherein the color segmentation and recognition technique uses a neural network and an associated rulebase to identify and classify the object.

22. (Original) The system as set forth in claim 14, wherein the object is a void and the shape feature segmentation and analysis technique is operable to extract the void from the image and to characterize the shape of the void by correlating a bright area of the void with a dark region of the void using a fuzzy logic correlator, wherein the bright area and the dark region are enhanced by the grazing angle of the illumination.

23. (Currently Amended) A method of substantially automatically performing an evaluation of a sample of a material according to an established standard, wherein the method comprises the steps of:

(a) magnifying and illuminating the sample, wherein the illumination is provided at a grazing angle so as to enhance ~~surface~~ a contrast between surface features of the sample;

(b) capturing an image of the magnified and illuminated sample;

(c) controlling magnification and illumination of the sample and capturing of the image substantially automatically, using a computing device; and

(d) performing an analysis of the image substantially automatically, using a computing device, to identify surface features of the sample and determine characteristics of the sample therefrom ~~to allow for the evaluation of the sample~~ in accordance with the established standard.

24. (Original) The method as set forth in claim 23, wherein the analysis in step (d) includes identification of one or more components of the sample.

25. (Original) The method as set forth in claim 23, wherein the analysis in step (d) includes identification of one or more physical features of the sample.

26. (Original) The method as set forth in claim 23, further including step (e) preparing the sample prior to performing step (a) so as to facilitate the analysis.

27. (Original) The method as set forth in claim 26, wherein the material is concrete and the preparation in step (e) includes polishing a face of the sample, and the analysis in step (d) includes identifying and measuring any voids in the sample.

28. (Original) The method as set forth in claim 23, wherein step (c) includes moving the sample in a precise computer-controlled manner so as to avoid overlapping fields-of-view.

29. (Original) The method as set forth in claim 23, wherein the analysis in step (d) includes -

(d_1) facilitating identification and classification of an object in the image and differentiating the object from other objects in the image using a color segmentation and recognition technique;

(d_2) extracting the object from the image and characterizing a shape of the object using a shape feature segmentation and analysis technique; and

(d_3) analyzing individual scans across the image to identify a unique characteristic of a profile of the object using a intensity profile segmentation and recognition technique.

30. (Original) The method as set forth in claim 29, wherein the color segmentation and recognition technique in step (d_1) is based on one or more color planes selected from the group consisting of: three color RGB, hue, and saturation.

31. (Original) The system as set forth in claim 29, wherein the color segmentation and recognition technique in step (d_1) uses a nearest neighbor technique to identify and classify the object.

32. (Original) The system as set forth in claim 29, wherein the color segmentation and recognition technique in step (d_1) uses a neural network and an associated rulebase to identify and classify the object.

33. (Original) The system as set forth in claim 29, wherein the object is a void and the shape feature segmentation and analysis technique in step (d_2) is operable to extract the void from the image and to characterize the shape of the void by correlating a bright area of the void with a dark region of the void using a fuzzy logic correlator, wherein the bright area and the dark region are a result of the grazing angle of the illumination.

34. (Currently Amended) A method of substantially automatically performing an evaluation of a sample of a material according to an established standard, wherein the method comprises the steps of:

(a) preparing the sample in a manner consistent with the established standard in order to facilitate analyzing the sample;

(b) magnifying and illuminating the sample, wherein the illumination is provided at a grazing angle so as to enhance ~~surface~~ a contrast between surface features of the sample;

(c) capturing an image of the magnified and illuminated sample;

(d) controlling magnification and illumination of the sample and capturing of the image substantially automatically, using a computing device; and

(e) performing an analysis of the image substantially automatically, using a computing device, ~~to allow for the evaluation of the sample~~ to identify surface features of the sample and determine characteristics of the sample therefrom in accordance with the established standard, wherein the analysis includes -

(e_1) facilitating identification and classification of an object in the image and differentiating the object from other objects in the image using a color segmentation and recognition technique,

(e_2) extracting the object from the image and characterizing a shape of the object using a shape feature segmentation and analysis technique, and

(e_3) analyzing individual scans across the image to identify a unique characteristic of a profile of the object using a intensity profile segmentation and recognition technique.

35. (Original) The method as set forth in claim 34, wherein the analysis in step (e) includes identification of one or more components of the sample.

36. (Original) The method as set forth in claim 34, wherein the analysis in step (e) includes identification of one or more physical features of the sample.

37. (Original) The method as set forth in claim 34, wherein the material is concrete and the preparation in step (a) includes polishing a face of the sample, and the analysis in step (e) includes identifying and measuring any voids in the sample.

38. (Original) The method as set forth in claim 34, wherein step (d) includes moving the sample in a precise computer-controlled manner so as to avoid overlapping fields-of-view.

39. (Original) The method as set forth in claim 34, wherein the color segmentation and recognition technique in step (e_1) is based on one or more color planes selected from the group consisting of: three color RGB, hue, and saturation.

40. (Original) The system as set forth in claim 34, wherein the color segmentation and recognition technique in step (e_1) uses a nearest neighbor technique to identify and classify the object.

41. (Original) The system as set forth in claim 34, wherein the color segmentation and recognition technique in step (e_1) uses a neural network and an associated rulebase to identify and classify the object.

42. (Original) The system as set forth in claim 34, wherein the object is a void and the shape feature segmentation and analysis technique in step (e_2) is operable to extract the void from the image and to characterize the shape of the void by correlating a bright area of the void with a dark region of the void using a fuzzy logic correlator, wherein the bright area and the dark region are a result of the grazing angle of the illumination.